

### **Amendments to the Claims:**

The listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

1.-37. (Canceled)

38. (New) A method for automated application of self-adhesive film to bodywork parts, in which a film blank is gripped on the non-adhesive outer face at two opposite ends by means of suction grippers to which a vacuum can be applied, and is held stretched out, in which the film blank which is held stretched out is aligned accurately in position above the bodywork part to be bonded to and is adhesively bonded to it, comprising the steps:

providing prefabricated, elongated paint film blanks in a configuration according to features a to c) for application of paint film, and in that the paint film blanks which have been provided in this way are moved according to features d) to g) for automated application:

a) including each prefabricated, elongated paint film blank in a film composite and provided on the outside and underneath with an adherent but easily detachable protective strip, with each of the two protective strips projecting (projections) beyond a useful length (L) of the paint film blank at two ends, which are located in the area of the narrow faces of the paint film blank,

- b) approximately matching the length, measured in the longitudinal direction of the film blank, of an end projection to an attachment width ( $b_2$ ) of the associated suction gripper measured in the longitudinal direction of the paint film blank while, in contrast, the length of a start-side projection is likewise matched approximately to the attachment width ( $b_1$ ) of the associated suction gripper but with at least the lower protective strip on the start-side projection being lengthened by a specific gripping length beyond said attachment width ( $b_1$ ),
- c) providing the film composite which includes the paint film blank is offered in a defined position with the outer protective strip being freely accessible in the working area of a freely programmable industrial robot, which is provided with an application tool, for picking up by the application tool,
- d) pushing up the film composite by two of said suction grippers, which are provided on the application tool and whose sucking picking-up surfaces are located on a standard picking-up plane, on the upper protective strip in the area of the end and start-side projections, with the two suction grippers then being pivoted from the picking-up plane through a respective specific angle ( $\alpha$ ,  $\alpha'$ ), in such a way that the projections which have been picked up off the film composite that is held stretched out, project obliquely and approximately in mirror-image form with respect to one another from a picking-up plane in the direction of a rear face of the application tool,
- e) pulling off the lower protective strip, starting from a start-side end of the paint film blank and guided by a start-side projection, which is used as a pulling-off lug and is gripped by a gripping tool, which can move within

the application tool thus exposing the adhesive face of the paint film blank,

- f) once the film composite, which is held stretched out by the application tool has been aligned in the correct orientation at a short distance from the bodywork part, which is to be bonded to and is held firmly in the defined orientation and inflexibly, wiping the paint film blank onto the bodywork part to be bonded to, from the stretched-out separated position, by means of a flexible wiper which can move longitudinally within the application tool,
- g) pulling off the upper protective strip from the outer face of the applied paint film blank by means of a pulling-off movement of the the end suction gripper.

39. (New) The method as claimed in claim 38, wherein the pivoting movement of the two suction grippers takes place in such a manner that the tensile stress in the picked-up film composite is changed no more than negligibly by the pivoting movement.

40. (New) The method as claimed in claim 38, wherein a magnitude of a pivoting angle ( $\alpha$ ,  $\alpha'$ ) of the suction grippers is greater than the largest angle ( $\beta$ ) which occurs during the application process between the film composite on the one hand and the connecting line between the two boundary edges, which are located on the picking-up plane), of the opposite suction grippers on the other hand.

41. (New) The method as claimed in claim 38, wherein a supporting film which corresponds to the thickness of the paint film, is in each case inserted between the two protective strips in the area of the projections, so that the film composite is formed with three layers over its entire length - apart from certain interruptions - and has a uniform thickness (D) and in that the film composites are provided in a stacked form.

42. (New) The method as claimed in claim 41, wherein the film composites are stacked at least in an approximately horizontal position.

43. (New) The method as claimed in claim 38, wherein, at the start of the application process, the lower protective strip is pulled off only partially and the adhesive face of the paint film blank is initially only partially exposed, and in that the rest of the process of pulling off the lower protective strip and exposure of the adhesive face of the paint film blank are carried out corresponding to the progress of the process of wiping the paint film blank onto the bodywork part.

44. (New) The method as claimed in claim 38, wherein the paint film blank is wiped onto the bodywork part in only a single direction and with only one wiper.

45. (New) The method as claimed in claim 38, wherein, during the wiping on process, an approximately constant distance is maintained between

the progressing wiper on the one hand and the likewise progressing pulling-off point on the lower protective strip that is to be pulled off.

46. (New) The method as claimed in claim 38, wherein the process of pulling off the lower protective strip is carried out by the superimposition on the one hand of a translational movement of a winding device, which winds up the lower protective strip (9) and is moved at a speed which matches the speed of the wiper, and on the other hand by a winding movement of the winding device, with the winding device likewise winding up the pulled-off protective strip at a speed which matches the speed of the wiper.

47. (New) The method as claimed in claim 38, wherein the end suction gripper approaches the bodywork surface to be bonded over towards the end of the wiping-on process.

48. (New) The method as claimed in claim 38, wherein the end projection of the film composite which is gripped by the end suction gripper is allowed to continue sliding towards the end of the wiping-on process.

49. (New) The method as claimed in claim 38, wherein the wiping-on process is carried out with a linear pressure of between 10 and 50 N/cm.

50. (New) The method as claimed in claim 38, wherein the paint film blank is wiped on by means of a wiper composed of a hard felt with a thickness of about 10 to 20 mm.

51. (New) The method as claimed in claim 38, wherein, in order to pull the outer protective strip off the completely applied paint film blank, the application tool is pivoted away from the bodywork surface about a virtual pivoting axis which is at least one of located in the vicinity of one of the suction grippers, and is moved in the direction of the opposite end of the paint film blank such that the suction gripper which has been moved away pulls the outer protective strip off the applied paint film blank.

52. (New) An apparatus for automated application of self-adhesive film to bodywork parts, comprising an application tool which can be handled by a freely programmable industrial robot and which has two suction grippers, which are arranged at a distance from one another and to which air or a vacuum can be applied deliberately, on a working face, which suction grippers can grip one film blank at two opposite ends on the non-adhesive outer face and can hold it stretched out, such that the film blank can be handled freely by the industrial robot in the stretched-out state, in order to carry out the method as claimed in claim 38, wherein for the application of elongated, prefabricated paint film blanks, which are in each case included in a film composite which is designed to be suitable for automation and is produced on an individual basis, the application tool is provided with the following features:

- a) the two suction grippers are each arranged in the application tool such that they can pivot and are provided with a pivoting drive such that the suction grippers can be pivoted with their sucking picking-up surface onto a standard picking-up plane - the picking-up position - in order to transfer a paint film composite which has been provided, or can be pivoted to a working position, which positions are approximately in mirror-image form with respect to one another, and in which working position the sucking picking-up surfaces project from the standard picking-up plane in the direction of the flat face of the application tool which is opposite the working face and is referred to in the following text as the “rear face”,
- b) a gripping tool which can be moved parallel is arranged adjacent to one of the suction grippers, which is referred to in the following text as the “start suction gripper”, and this gripping tool can on the one hand be moved onto the picking-up plane alongside the start suction gripper such that it is ready to pick up, and on the other hand can be moved from this start position under the picking-up plane to a working plane and, furthermore, on the working plane parallel to the working plane and parallel to itself, and
- c) a wiper is arranged within the application tool, can be moved with its working edge from a waiting position, in which it has been moved back from the picking-up plane, to a working position in which it is located close to the picking-up plane, can be pressed on with a specific force, and in this position can be moved in a straight line and parallel to the picking-up plane.

53. (New) The apparatus as claimed in claim 52, wherein a horizontal stacking platform which is mounted elastically, is arranged in the working area of the industrial robot that is handling the application tool, and has side holding and guide webs, on which the film composites are offered at least approximately in a horizontal position to the application tool in a stacked form.

54. (New) The apparatus as claimed in claim 53, wherein the stacking platform is held at a variable height and is provided with a controllable height adjustment drive, in such a way that the upper edge of the stack is always at a constant height position, irrespective of the number of film composites in the stack.

55. (New) The apparatus as claimed in claim 52, wherein the pivoting axes of the two suction grippers are located on the picking-up plane and close to that boundary edge of the suction grippers which faces the paint film blank, such that the tensile stress in the picked-up film composite is changed no more than negligibly by a pivoting movement of the suction grippers.

56. (New) The apparatus as claimed in claim 52, wherein:

a) the pivoting bearing of the start-side suction gripper is in the form of a conventional journal bearing, whose center point is offset with respect to the picking-up plane of the application tool in the direction of its rear face to such an extent that those outlines of the journal bearing which are closest to the picking-



up plane are themselves still offset with respect to the picking-up plane of the application tool in the direction of its rear face,

b) the pivoting bearing for the end suction gripper is in the form of a four-bar linkage with two rockers which are each articulated on the one hand on the end suction gripper and are each articulated on the other hand the application tool, with the moving instantaneous center of rotation for the pivoting movement of the end suction gripper which is caused by this being offset in all of its positions with respect to the picking-up plane of the application tool in the opposite direction to the journal bearing,

c) the four-bar linkage bearing for the end suction gripper is designed with respect to the mutual arrangement of the hinge points and the length of the rockers such that the position offset (distance  $h'$ ), which results from the pivoting, of the boundary edge of the end suction gripper close to the blank is of the same size, in terms of its magnitude and direction, as the corresponding position offset (distance  $h'$ ) of the start-side suction gripper.

57. (New) The apparatus as claimed in claim 52, wherein the suction grippers can pivot through a fixed pivoting angle ( $\alpha$ ,  $\alpha'$ ) which can be predetermined by stops between 10 and 45°.

58. (New) The apparatus as claimed in claim 52, wherein the gripping tool is mounted such that it can rotate and is designed so that it can be driven to rotate, and has an approximately constant, approximately round cross section over its longitudinal extent, such that it can at the same time be used as a coil

core for a material which is in the form of a strip and is gripped by the gripping tool at the end.

59. (New) The apparatus as claimed in claim 52, wherein the gripping tool is in the form of long-nose pliers which can move within the application tool and have an upper jaw part which is arranged above the picking-up plane, at least in the initial position in which it is ready to pick up - and have a lower jaw part, which is arranged underneath the picking-up plane, wherein only the lower jaw part can move, in the sense of an opening and closing movement of the long-nose pliers.

60. (New) The apparatus as claimed in claim 59, wherein the lower jaw part can be pivoted through  $90^\circ$  in the sense of an opening and closing movement of the long-nose pliers, such that, in the initial position of the long-nose pliers, in which they are completely open and are ready to pick up, the lower jaw part projects at right angles to the picking-up plane and away from the application tool.

61. (New) The apparatus as claimed in claim 59, wherein, in the sense of an opening and closing movement of the long-nose pliers, the lower jaw part can be moved parallel to itself in the closing sense towards the upper jaw part, and can be moved away from it in the opening sense, and in that the long-nose pliers as an entity can be moved out of and into the area of the film composite to be picked up from the side and transversely with respect to its longitudinal

extent, wherein the distance (transverse distance  $H_q$ ) through which the gripping tool can be moved corresponds at least to the width of the film composite to be picked up.

62. (New) The apparatus as claimed in claim 61, wherein the gripping tool, which can be driven to rotate and is at the same time used as a coil core for the lower protective strip is held in a spindle which itself is mounted such that it can move axially in a hollow shaft which is mounted such that it can rotate and can be driven to rotate, and is coupled to a linear movement drive, wherein the closing and opening movement of the gripping tool is derived from the axial movement of the spindle.

63. (New) The apparatus as claimed in claim 52, wherein the gripping tool, which can be driven to rotate and is at the same time used as a coil core for the lower protective strip, is in the form of a suction strip, which can move within the application tool and to which air or a vacuum can be applied in a controlled manner, which suction strip has an approximately semicircular or D-shaped cross section, has a sucking contact surface on the flat face, and whose contact surface can be applied to the start-side projection of the film composite that is held in the application tool.

64. (New) The apparatus as claimed in claim 52, wherein the gripping tool, which can be driven to rotate and is at the same time used as a coil core for the lower protective strip, can be moved deliberately to a rotation position such

that the picking-up surface of the gripping tool is ready to pick up parallel to the start-side projection of the film composite which is held in the application tool.

65. (New) The apparatus as claimed in claim 52, characterized in that the rotation speed of the rotary drive of the gripping tool which is used at the same time as a coil core can be controlled during the winding process such that an at least approximately constant circumferential speed of the coil which can be predetermined, can be maintained irrespective of an increasing diameter of the coil.

66. (New) The apparatus as claimed in claim 52, wherein the wiper and the gripping tool are connected to one another, or are coupled to one another and can be moved at the same speed, with a fixed association (distance A) in the working position.

67. (New) The apparatus as claimed in claim 52, wherein the intensity of the vacuum during the time in which it can be applied can be varied separately at least for the end suction gripper such that the fixing force can be varied towards the end of the wiping-on process in the sense of allowing it to continue to slide.

68. (New) The apparatus as claimed in claim 52, wherein the wiper can be pressed onto the film blank and/or onto the bodywork part which is held inflexibly with a linear pressure amounting to 10 to 50 N/cm.

69. (New) The apparatus as claimed in claim 52, wherein the wiper is composed of a hard felt with a thickness of about 10 to 20 mm.

70. (New) An elongated, prefabricated paint film composite which is intended for application to specific bodywork parts, in which a usable paint film blank is provided both on the outside and underneath with an adherent but easily detachable protective strip, wherein for automated application of the paint film blank by means of an application tool, which can be handled by means of a programmable industrial robot, to the film composite, both the outer protective strip and the lower protective strip each project beyond the paint film blank at the two ends which are located in the area of the narrow faces of the paint film blank, wherein the length, measured in the longitudinal direction of the film blank, of one projection, is approximately matched to the attachment width (b<sub>2</sub>) of the associated suction gripper measured in the longitudinal direction of the paint film blank while, in contrast, the length of the other projection, which is likewise matched approximately to the attachment width (b<sub>1</sub>) of the associated suction gripper wherein, however, at least the lower protective strip is lengthened beyond the said attachment width (b<sub>1</sub>) on the other side projection by a specific gripping length in order to be gripped by a protective strip pulling-off apparatus.

71. (New) The paint film composite as claimed in claim 70, wherein a supporting film which corresponds to the thickness of the paint film, is in each

case inserted between the two protective strips in the area of the projections of the protective strips, such that the film composite has three layers over the entire length of at least the outer protective strip and has a uniform thickness with the exception of a plurality of narrow interruptions.

72. (New) The paint film composite as claimed in claim 71, wherein, in the area of the other projection the upper protective strip is also lengthened by the gripping length beyond said attachment width ( $b_1$ ) and is connected to the lengthened lower protective strip with a supporting film inserted between them, and in that the upper protective strip and the supporting film are slotted at the same point and over the entire width of the film composite along a line which runs transversely with respect to the longitudinal direction of the film composite and which is located in the area between the other projection and the pulling-off lug around said gripping length while, in contrast, the lower protective strip is also continuous at this point.

73. (New) The paint film composite as claimed in claim 70, wherein the supporting film is identical to the paint film but is separated from the usable part of the paint film blank by an interruption.

74. (New) The paint film composite as claimed in claim 70, wherein the lower protective strip is provided with an antistick coating such that it is easier to detach the lower protective strip from the adhesive face of the paint film blank than to detach the latter from the outer protective strip.

75. (New) The method according to claim 49, wherein the linear pressure is between 2D and 30 N/cm.

76. (New) The method according to claim 51, wherein said one suction gripper is the start-side suction gripper.

77. (New) The apparatus of claim 57, wherein the stops are between 15 and 30 degrees.